Forested Lands and Wood Products Biodegradable Carbon Emissions & Sinks

Category	2000	2001	2002	2003	2004	2005	2006	Data Source
Sinks (million tonnes of CO_2)								
Forested Lands Removals								
▪ *Forest woody biomass growth*	*-13.052*	*-13.042*	*-13.032*	*-13.022*	*-13.012*	*-13.002*	*-12.993*	*Winrock*
▪ *Rangeland woody biomass growth*	*-1.097*	*-1.096*	*-1.095*	*-1.094*	*-1.093*	*-1.093*	*-1.092*	*Winrock*
Total Sinks	**-14.148**	**-14.137**	**-14.127**	**-14.116**	**-14.105**	**-14.095**	**-14.084**	
Emissions (million tonnes of CO_2)								
Forested Lands Emissions								
▪ *Forest and rangeland fires*	*2.018*	*2.017*	*2.015*	*2.014*	*2.012*	*2.010*	*2.009*	*Winrock*
▪ *Other disturbances (such as insect pests damage)*	*1.200*	*1.199*	*1.198*	*1.197*	*1.196*	*1.195*	*1.194*	*Winrock*
▪ *Development of forest or range lands (Landuse change)*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*Winrock*
▪ *Timber harvest slash*	*0.155*	*0.155*	*0.155*	*0.155*	*0.155*	*0.155*	*0.155*	*Winrock*
Wood Products Emissions								
▪ *Fuel wood*	*1.521*	*1.520*	*1.519*	*1.518*	*1.517*	*1.515*	*1.514*	*Winrock*
▪ *Wood Waste Dumps*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*CIWMB*
▪ *Discarded wood and paper in landfills*	*3.753*	*3.942*	*4.077*	*4.034*	*4.044*	*4.201*	*4.310*	*ARB Model*
▪ *Composting of wood waste materials*	*0.743*	*0.743*	*0.745*	*0.800*	*0.803*	*0.805*	*0.808*	*CIWMB/USEPA*
Total Emissions	**9.411**	**9.597**	**9.730**	**9.738**	**9.747**	**9.904**	**10.012**	
Net CO_2 Flux (million tonnes of CO_2)								
Sinks + Emissions	**-4.737**	**-4.540**	**-4.397**	**-4.378**	**-4.358**	**-4.191**	**-4.073**	

Methodology

The net CO_2 flux for the forest sector is estimated by summing CO_2 removals from the atmosphere and CO_2 emissions to the atmosphere of managed lands and the wood products pool. Removals of CO_2 from the atmosphere occur as a result of vegetation biomass growth. Emissions of CO_2 to the atmosphere occur as a result of a variety of activities. These include emissions from oxidation of timber harvest slash, fuel wood, biomass consumed in wildfires, other disturbance (land use change or unspecified), or from the decomposition of landfilled or composted wood products consumed in the state. CO_2 removals and emissions by urban forests will be included pending further data. This table focuses on forested lands, therefore CO_2 removals and emissions on (non)woody crop lands are not reported, pending further study.

Data Sources

● **Winrock:** CEC (2004). Baseline Greenhouse Gas Emissions for Forest, Range, and Agricultural Lands in California. CEC PIER final report CEC-500-04-069F. Annual average forest and range land CO2 removal and emission rates for period 1994 - 2000 in Table 1-21, CEC (2004) scaled to state-wide in CEC (2006): Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004. Publication CEC-600-2006-013-SF. Emissions and removals are back-cast to 1990 from 1994 using 0.1707% per year forest land area trend from 1953 to 1994, from p. 14 in Shih (1998): The Land Base of California's Forests. Fire and Resource Assessment Program, California Dept. of Forestry and Fire Protection. Emissions and removals forecasted from 2000 using 4% forest land area decline predicted for 1997 to 2050 in the Pacific Coast Region, from p. 53 in: Area Changes for Forest Cover Types in the United States, 1952 to 1997, with projections to 2050. (2004) USDA Forest Service, Pacific Northwest Research Station, publication PNW-GTR-613.

● **CIWMB/USEPA:** California Integrated Waste Management Board SWIS waste-in-place and landfill survey data, USEPA Harvested Wood Products use data provided by Kenneth Skog (Forest Products Laboratory, USDA Forest Service, Madison, WI), scaled to state based on population.

● **ARB Model:** From IPCC Mathematically Exact First-Order Decay Model, with CIWMB SWIS waste-in-place and landfill survey data.

Diagram of the Atmospheric Flow Approach to Forested Lands and Wood Products Carbon Accounting for the California GHG Inventory.

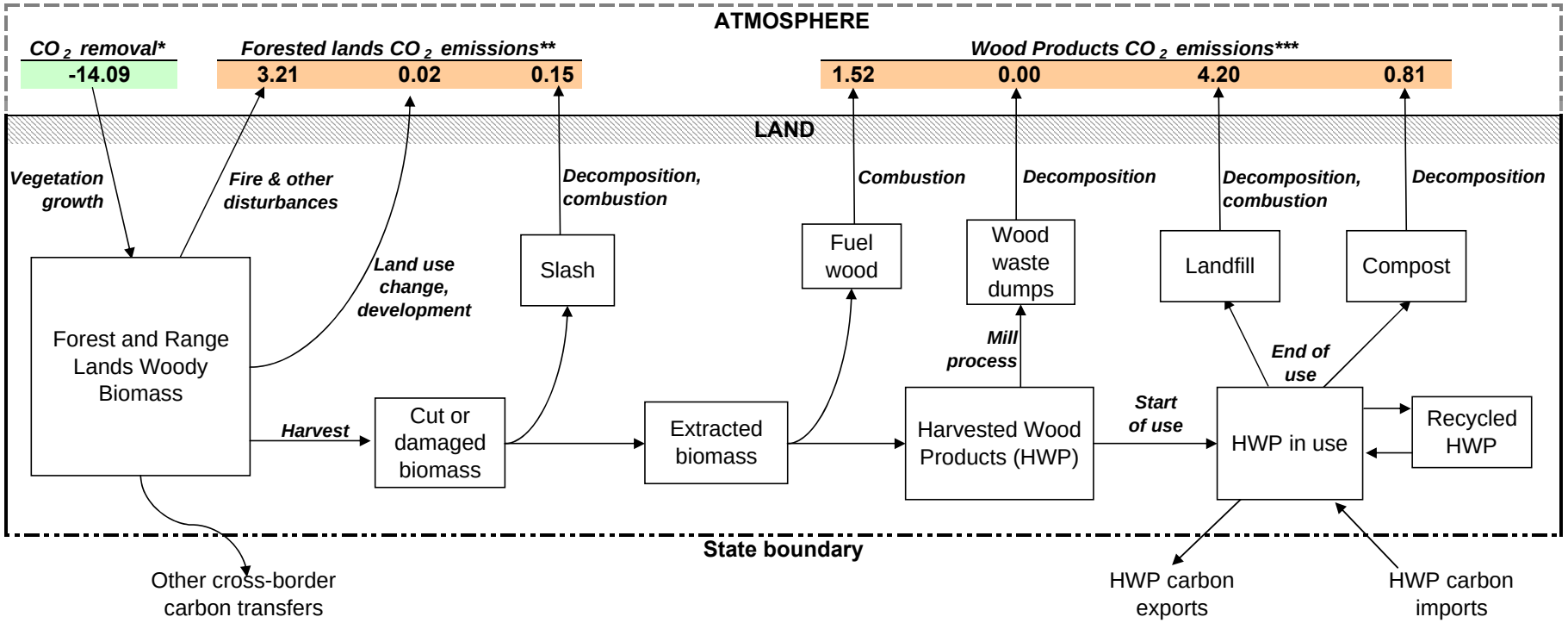
Adapted from:

1) Figure 12.A.2. System boundary of the Atmospheric Flow Approach. In: Chapter 12, Harvested Wood Products. Volume 4, Agriculture, Forestry, and Other Land Use (AFOLU). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. IPCC National Greenhouse Gas Inventories Programme.

2) Figure 1-6. Flow diagram illustrating the various destinations of pre-harvest carbon after commercial harvest. In: Baseline Greenhouse Gas Emissions for Forest, Range, and Agricultural Lands in California. (2004) California Energy Commission PIER final report 500-04-069F.

2005 Net CO2 Flux = Sinks + Emissions = -14.09 + 9.90 = -4.19

Values for 2005 in million tonnes of CO_2 (Biodegradable carbon only, no fossil fuel CO_2)



* ***CO_2 removals*** from the atmosphere include vegetation biomass growth in forests and wooded range lands.

** ***Forested lands CO_2 emissions*** to the atmosphere include biomass oxidation resulting from from forest and range lands fires and other disturbances such as insect pests, forest and range land use change (development), decomposition/combustion of slash after tree harvest.

*** ***Wood Products CO_2 emissions*** to the atmosphere include: fuel wood combustion, decomposition of wood mill waste and discarded wood products in landfills and composting facilities.

The Atmospheric Flow Approach estimates fluxes of carbon to and from the atmosphere for the forest lands and wood products pools within the state boundary, and reports where and when emissions to the atmosphere and removals from the atmosphere occured. The estimates of emissions/removals include CO_2 removals of carbon from the atmosphere due to vegetation biomass growth, and CO_2 releases to the atmosphere from fire and disturbances and the oxidation of harvested wood products that are consumed in the state. (Adapted from: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry, and Other Land Use.)